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Having thus described the preferred embodiments, the invention is now claimed to be:

1. A furnace comprising:

a vessel which defines an interior chamber for receiving items to be treated;

a means for heating the vessel;

a cap which selectively closes the interior chamber of the vessel; and

a cooling assembly including:

a dome which defines a chamber, and

a lifting mechanism which selectively lifts the cap allowing hot gas to flow from the interior chamber of the vessel into the dome.

2. The furnace of claim 1, wherein the dome is selectively mountable over the vessel.

3. The furnace of claim 1, wherein the lifting mechanism includes a linear actuator.

4. The furnace of claim 3, wherein the linear actuator is operatively connected with the cap by a lift rod.

5. The furnace of claim 4, wherein a lower end of the lift rod is mounted for vertical movement within the dome and the linear actuator is carried by the dome.

6. The furnace of claim 1, wherein the lifting mechanism moves the cap between a first position, wherein the cap closes the interior chamber of the vessel, and a second position, wherein the cap is positioned within the dome chamber.

7. The furnace of claim 1, wherein the dome chamber is capable of maintaining a positive pressure of an inert gas.

8. The furnace of claim 1, further including:
cooling means for actively cooling the dome.

9. The furnace of claim 8, wherein the cooling means include cooling coils, mounted to a surface of the dome, through which a cooling fluid is passed.

10. The furnace of claim 1, further including:
a temperature detector which monitors a temperature of the dome.

11. The furnace of claim 1, wherein the heating means includes an induction coil and the vessel includes a susceptor, the induction coil inducing a current in the susceptor to heat the susceptor.

12. The furnace of claim 11, wherein the dome is formed from a non-magnetic material.

13. The furnace of claim 11, wherein the susceptor is formed from graphite, the induction furnace further including:
a layer of flexible graphite, exterior to the susceptor, which inhibits escape of carbon vapor which has sublimed from the susceptor.

14. A cooling assembly for an induction furnace comprising:
a dome which defines an interior chamber;
cooling means for cooling the dome;
a means for selectively providing fluid communication between a hot zone of the induction furnace and the dome; and

means for controlling the communicating means in accordance with at least one of:

a temperature of the hot zone, and

a temperature of the interior chamber.

15. The assembly of claim 14, wherein the cooling means include: cooling coils through which a cooling fluid is passed to cool the dome.

16. The assembly of claim 14, wherein the means for selectively providing fluid communication include:

a lifting mechanism which selectively moves a cap of the furnace from a first position, in which the cap closes the hot zone from the dome interior chamber, and a second position, in which hot gas flows from the hot zone into the dome.

17. An induction furnace comprising:

a susceptor which defines an interior chamber for receiving items to be treated, the susceptor being formed from graphite;

an induction coil which induces a current in the susceptor to heat the susceptor; and

a layer of flexible graphite, exterior to the susceptor, which inhibits escape of carbon vapor which has sublimed from the susceptor.

18. The furnace of claim 17, further including:

a layer of powdered insulation material, packed around the layer of flexible graphite, which holds the layer of flexible graphite in contact with the susceptor.

19. A method of operating a furnace comprising:

heating items to be treated in a first chamber which contains a gas;

actively cooling a second chamber which contains a gas, the second chamber being selectively fluidly connectable with the first chamber;

after the step of heating, cooling the first chamber by selectively fluidly connecting the first chamber with the second chamber, thereby allowing heat to flow from the gas in the first chamber to the gas in the second chamber.

20. The method of claim 19, further including:

detecting a temperature of the second chamber; and

controlling a size of an opening between the first and second chambers to ensure that the temperature of the second chamber remains below a preselected level.

21. The method of claim 19, further including:

prior to the step of heating, placing witness disks in the first chamber; and

after the step of cooling the first chamber, removing the witness disks and examining the disks to determine a maximum temperature to which each of the disks was exposed during the step of heating.

22. The method of claim 19, wherein the step of heating includes heating the first chamber to a temperature of at least 3000°C.

23. The method of claim 22, wherein the step of heating includes heating the first chamber to a temperature of at least 3100°C.

24. The method of claim 22, further including, prior to the step of heating:

surrounding a wall of the first chamber, which is formed from graphite, with a flexible graphite material which inhibits evaporation of the graphite from the wall during the heating step.

25. The method of claim 19, wherein the gas in the first and second chambers is an inert gas at a positive pressure.

26. The method of claim 19, wherein the step of cooling the first chamber includes selectively fluidly connecting the first chamber with the second chamber when the temperature within the first chamber drops to about 1500°C.

27. The method of claim 19, wherein the step of selectively fluidly connecting the first chamber with the second chamber includes:

raising a cap which selectively closes the first chamber to provide an opening between the first and second chambers, a size of the opening being adjustable by raising or lowering the cap.

28. The method of claim 19, further including:

mounting a dome over the first chamber to seal the first chamber from the ambient environment, the dome defining the second chamber and being spaced from the first chamber by a cap, the dome carrying a lifting mechanism which selectively lifts the cap allowing fluid communication between the first chamber and the second chamber during the cooling step.